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09/966,572	09/25/2001	Ho-Jin Kweon	47227/DBP/Y35	3776

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EXAMINER

WILLS, MONIQUE M

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 09/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/966,572

Applicant(s)

KWEON ET AL.

Examiner

Wills M Monique

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 September 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 September 2001 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

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## **DETAILED ACTION**

### ***Priority***

Republic of Korea foreign priority document(s) 2000-56245 and 2001-36766, filed January 4, 2002 and submitted under 35 U.S.C. 119(a)-(d), has/have been received and placed of record in the file.

### ***Information Disclosure Statement***

The information disclosure statement(s) filed September 10, 2002 has/have been received and complies with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6 are rejected under 35 U.S.C. 102(b) as being anticipated by Amatucci et al. U.S. Patent 5,705,291.

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Amatucci teaches a positive electrode composition layer coated on a current collector (col. 2, lines 60-68). The positive electrode composition layer comprises  $\text{LiMn}_2\text{O}_4$  coated with a layer of boron oxide lithium hydroxide, aluminum oxide or mixtures thereof and heated to a temperature of about  $400^\circ\text{C}$  (col. 2, lines 15-30). The coating is inherently amorphous or crystalline. The coating mixture includes 0.4 to 1.0% by weight of lithiated borate to coat the active material (col. 5, lines 25-35). The resulting electrode was placed in a Li-ion battery cell (col. 4, lines 60-68) inherently comprising a second electrode and separator. Therefore, the instant claims are anticipated by Howard.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1 & 3-6 are rejected under 35 U.S.C. 102(e) as being anticipated by Howard Jr. et al. U.S. Patent 6,558,844.

Howard teaches a  $\text{Li}_{1+x}\text{Mn}_{2-x}\text{O}_4$  comprising a protective coating of metal oxides (col. 3, lines 45-65). The metal oxides include lithium oxides, aluminum oxides and rare

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earth metal oxides and mixtures thereof (col. 4, lines 10-35). The spinel is coated with metal oxides particles in an amount less than or equal to 2.5 mole % (inherently encompassing up to 1wt%). Therefore, the instant claims are anticipated by Howard.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7,8,11-14, & 17-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Wang U.S. Patent 5,783,328.

Wang teaches a method of coating a spinel of  $\text{Li}_{1+x}\text{Mn}_2\text{O}_4$  with lithium hydroxide (col. 2, lines 55-65). The spinel may be first treated with other hydroxides instead of or in addition to lithium hydroxide including potassium hydroxide or sodium hydroxide or any mixture thereof (col. 2, lines 55-65). The coated spinel is dried by heating at a temperature of about 200°C to 700°C in carbon dioxide gas (col. 2, lines 55-65) for about 1 to 20 hours (col. 2, lines 35-45). The resulting mixture is compressed into a positive electrode and placed in a coin cell with a negative electrode (col. 9, lines 50-65). The cell inherently has a separator disposed therebetween. In an alternative preferred embodiment, the lithium manganese oxide spinel powder may be first treated

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by immersing it in an aqueous hydroxide solution, of sodium hydroxide (NaOH), potassium hydroxide (KOH), or lithium hydroxide (LiOH) or mixtures thereof. The immersion of spinel powder in hydroxide solution may be carried out in a heated hydroxide solution or under ambient conditions. After immersion in the hydroxide solution, the solution is then heated to remove water therefrom leaving behind a wet lithium hydroxide coating on the spinel particles. The spinel particles may then be heated on a hot surface to remove all excess water leaving behind a dry hydroxide coating on the particles. Thereupon, the hydroxide coated spinel may be subjected to treatment with carbon dioxide gas at temperatures between about 200 °C and 700 °C. in the above described manner forming a carbonate coating on the surface of the spinel. See column 5, lines 35-52 and Example 4.

A preferred treatment of spinel may also involve pre-coating the spinel with both an alkali metal hydroxide, e.g., lithium hydroxide and a soluble metal salt of carboxylic acid, e.g., a water soluble transition metal salt of a carboxylic acid such as cobalt acetate. This may be accomplished either in a single step with metal hydroxide and metal salt of a carboxylic acid both present in the same solution or two separate steps with the metal hydroxide present in one solution and the metal salt of a carboxylic acid present in another solution. The pre-coated spinel is then heated in an atmosphere of carbon dioxide (alternatively, in an inert gas such as argon, helium or nitrogen) at temperature between about 200° C. and 700° C., preferably between about 200° C. and 400° C. Such preferred treatment is set forth in Example 8. This type of dual pretreatment of the spinel greatly reduces both irreversible storage loss (at 60° C.)

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regardless of whether the spinel is stored in charged or discharged state. See column 4, lines 40-55. Metal salts of carboxylic acids include transition metals from groups IIIB, IVB, VB, VIB, VIIB, VIII, IB and IIB of the periodic table (col. 3, lines 45-60).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9,10,15,16, & 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang U.S. Patent 5,783,328 as applied to claims 7 & 13 above, and further in view of Howard Jr. et al. U.S. Patent 6,558,844.

Wang teaches a coated lithiated compound as described hereinabove including coating the spinel with lithium hydroxide.

Wang does not expressly disclose the coating element containing less than 1wt% of the active material or the coating element source ranging from 0.1 to 50 wt %. The reference is silent to coating and heat treating three or more times or coating with  $\text{Al}_2\text{O}_3$  or employing  $\text{LiCoO}_2$  active material .

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However, Howard teaches that it is conventional to coat lithiated compounds with hydroxides in an amount which is less than or equal to 2.5 mole percent of the active material mixture. An amount greater than 2.5 mole percent of the spinel particles will create a thicker coating that will overly reduce the electrochemical capacity of the spinel (col. 4, lines 25-40). The reference also teaches the equivalence of employing lithium hydroxides and  $\text{Al}_2\text{O}_3$  (col. 4, lines 10-20) and  $\text{LiCoO}_2$  as a common alternative to lithium manganese spinels (col. 1, lines 10-20).

Wang and Howard are analogous art because they are from the same field of endeavor, namely, fabricating coated lithium spinel compounds to form positive active material for lithium secondary batteries.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ low coating weight percentages as taught by Howard, to obviate overly reducing the electrochemical capacity of the spinel.

Regarding repeating the coating and heating steps three or more times, it would have been obvious to repeat the coating and heating steps, Wang teaches that each coating and heating step improves the overall performance and storability of the spinel in rechargeable lithium cells (col. 3, lines 19-26).

Regarding the employment of  $\text{LiCoO}_2$  and  $\text{Al}_2\text{O}_3$ , it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the lithium cobalt oxide, since it has been held to be within general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. As evidenced by



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Howard,  $\text{LiCoO}_2$  is a commonly used alternative to lithium manganese oxides. Further, Howard teaches the equivalence of employing lithium hydroxides and  $\text{Al}_2\text{O}_3$  (col. 4, lines 10-20).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang U.S. Patent 5,783,328 in view of Amatucci et al. U.S. Patent 5,705,29 and further in view of Howard Jr. et al. U.S. Patent 6,558,844.

Wang teaches a coated lithiated compound as described hereinabove including coating the spinel with lithium hydroxide.

Wang does not expressly disclose the coating element containing less than 1wt% of the active material or the coating element source ranging from 0.1 to 50 wt %. The reference is silent to coating with boron.

Howard teaches that it is conventional to coat lithiated compounds with hydroxides in an amount which is less than or equal to 2.5 mole percent of the active material mixture. An amount greater than 2.5 mole percent of the spinel particles will

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create a thicker coating that will overly reduce the electrochemical capacity of the spinel (col. 4, lines 25-40).

Amatucci teaches the equivalence of lithium hydroxide and boron oxide coatings on lithiated spinel compounds.

Wang, Howard and Amatucci are analogous art because they are from the same field of endeavor, namely, fabricating coated lithium spinel compounds to form positive active material for lithium secondary batteries.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ low coating weight percentages as taught by Howard, to obviate overly reducing the electrochemical capacity of the spinel.

Regarding the employment of a boron coating, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the lithium cobalt oxide, since it has been held to be within general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. As evidenced by Amatucci, boron oxide is an equivalent coating to lithium hydroxide.

### ***Conclusions***

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Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Monique Wills whose telephone number is (703) 305-0073. The Examiner can normally be reached on Monday-Friday from 8:30am to 5:00 pm.

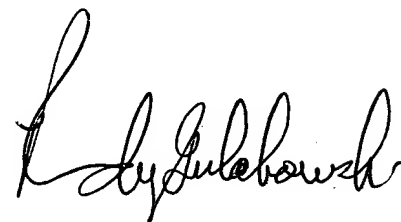
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

If attempts to reach Examiner by telephone are unsuccessful, the Examiner's supervisor, Randy Gulakowski, may be reached at 703-308-4333.

The unofficial fax number is (703) 305-3599. The Official fax number for non-final amendments is 703-872-9310. The Official fax number for after final amendments is 703-872-9311.

Mw

09/12/03



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